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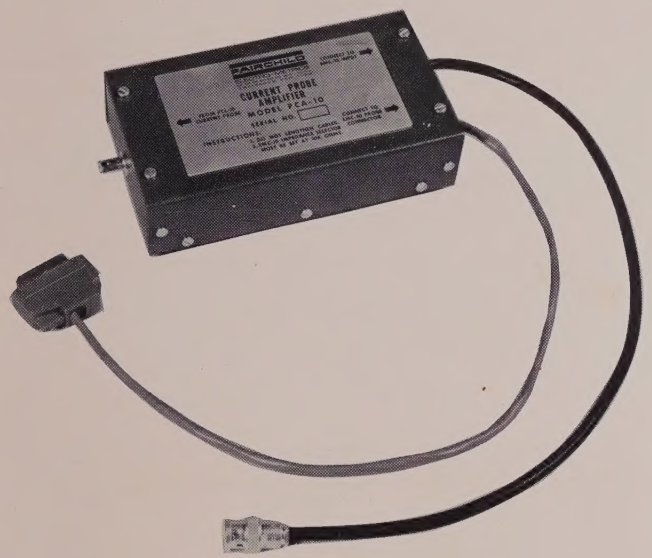
INSTRUCTION MANUAL

CURRENT PROBE AMPLIFIER



MODEL PCA-10

FAIRCHILD
ELECTRO-METRICS CORPORATION
A SUBSIDIARY OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION
AMSTERDAM, NEW YORK

INSTRUCTION MANUAL

CURRENT PROBE AMPLIFIER
MODEL PCA-10

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AMSTERDAM, NEW YORK

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SECTION I
INTRODUCTION

1.1 THE MANUAL

This manual includes information for the successful operation, maintenance, and repair of Model PCA-10 Current Probe Amplifier which is used in conjunction with the Model PCL-10 Current Probe.

1.2 THE PCA-10

The PCA-10 Current Probe Amplifier is used in conjunction with the PCL-10 Current Probe for measuring current flow through a conductor. This current is indicated directly on the EMC-10 meter; no calculations or conversion factors are necessary. The current is measured without direct connection to the circuit under test simply by clamping the probe around the current carrying conductor. In the case of more than one conductor, the response will be the algebraic sum of the currents.

The PCA-10 was designed to meet the broadband measurement requirements of Mil-Std-826 and Mil-Std-826A. This amplifier complements the probe's frequency response to produce a flat, one ohm transfer impedance output to the EMC-10. It makes possible direct voltage to amperage conversion with a minimum loss of sensitivity. When using this amplifier with the EMC-10 and PCL-10 according to approved Air Force procedure, the Mil-Std-826A conducted broadband specification measurement is made by a quick, single meter reading on the EMC-10.

The Current Probe Amplifier, Model PCL-10, receives power from the EMC-10 and has clearly marked input and output connectors.

SECTION II
THEORY OF OPERATION

2.1 The PCL-10 is an instrument type transformer which utilizes the conductor under test as a single turn primary. This is accomplished by clamping the probe or secondary winding around the conductor which induces a current in the probe. The current is amplified by the PCA-10 and transformed into a meaningful representation on the EMC-10 meter. The amplifier in the PCA-10 terminates the PCL-10 Current Probe with 50 ohms and feeds a 10K ohm load. The effects of stray fields are minimized by the electrostatically shielded cases of the probe and amplifier.

The PCA-10 was designed to complement the frequency response of the PCL-10 below 30 kHz to give a unity transfer impedance. The net result of the PCL-10 response curve and the PCA-10 negative response curve is a nominally flat, one ohm transfer impedance across the entire range of the EMC-10 (Fig. 2.1). This allows direct conversion from voltage to current on the EMC-10 meter according to definition of transfer impedance.

The transfer impedance of the PCA-10, PCL-10 system is defined as: $Z_t = E_o / I_1$

Where E_o is the voltage appearing at the input terminals of the EMC-10 and I_1 is the current in the conductor. If the constant transfer impedance is one ohm and the voltage is known, the formula may be transposed to $I_1 = E_o / 1$ ohm. Any value divided by one shall remain numerically the same, therefore, I_1 may be assumed to be numerically equal to E_o (absolute value of I_1 is equal to the absolute value of E_o).

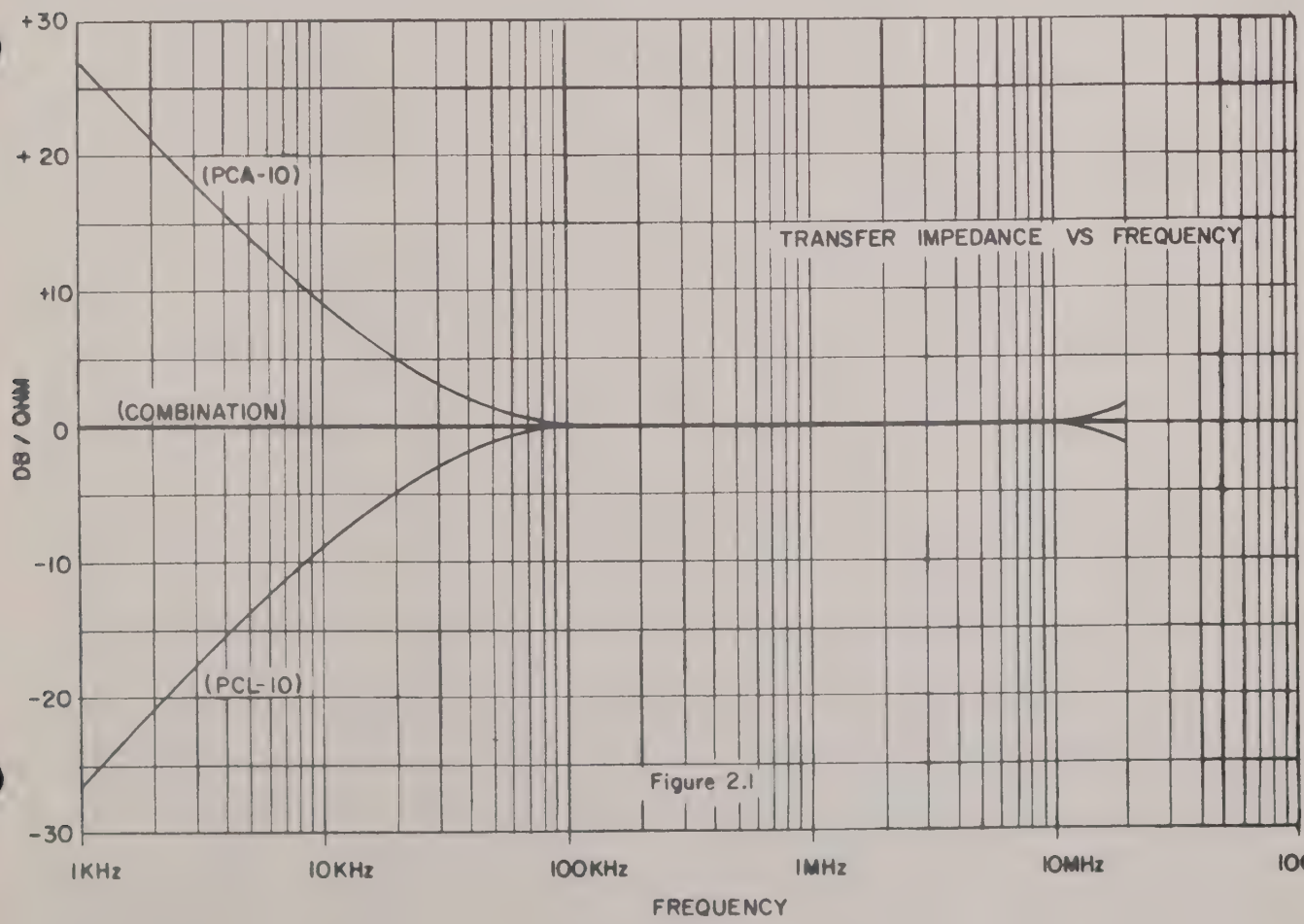


Figure 2.1

SECTION III

OPERATION INSTRUCTIONS

3.1 GENERAL

3.1.1 This section provides instructions for the operation of the PCA-10 with the EMC-10 in all modes.

3.2 UNPACKAGING

3.2.1 Remove the instrument carefully from the shipping carton and examine thoroughly for shipping damage. If there is any damage, replace the instrument in the shipping carton and immediately inform the manufacturer and the shipping company of the nature of the damage, the serial number of the instrument, the delivery date, and the invoice number.

3.2.2 Check the contents of the carton against the shipping slip to be sure that all components and accessory items are present. Notify the manufacturer immediately of any missing items.

3.3 ELECTRONIC SHIPPING DAMAGE

3.3.1 Before leaving the factory this instrument was subjected to a complete operational check. However, it is possible that electronic damage may have occurred in transit. It is desirable, therefore, to check the operation of the instrument as soon as possible after unpackaging.

To do so, perform the calibration tests out-lined in paragraph 4.3. If the instrument does not calibrate using this procedure, inform the manufacturer giving the basic information required in paragraph 3.2.1.

3.4 POWER REQUIREMENTS

3.4.1 All the power requirements are supplied by the EMC-10. Before making any measurement with the PCL-10 and PCA-10 the operator should become completely familiar with Section III Operating Instructions of the EMC-10 manual following the step-by-step procedure carefully.

3.5 NORMAL OPERATION

3.5.1 Calibrate the EMC-10 per paragraph 3.12 in the EMC-10 Instruction Manual.

3.5.2 For measuring the current in a conductor, the probe is fastened around the conductor of interest and the cables from the PCA-10 are connected to EMC-10 input (22, Fig. 4.3B) and probe connector (20, Fig. 4.3B). The value of current is read directly from the EMC-10 meter, because the absolute value of 1 volt is equal to the absolute value of 1 AMP by the one ohm transfer impedance of the setup. Measurements may be made in either BROADBAND or NARROWBAND modes.

3.6 BROADBAND SIGNALS TESTING MIL-STD-826A METHOD 3005

3.6.1 The EMC-10 is amplitude and frequency calibrated according to EMC-10 instruction manual, paragraph 3.12 allowing a 15 minute warm-up period.

3.6.2 After calibrations are made per paragraph 3.12 of the EMC-10 instruction manual, the front panel adjustments on the EMC-10 are to be changed as follows:

IMPEDANCE selector (23)*	10K ohms
FILTER (21)	20 kHz
BANDWIDTH (19)	Wideband
FREQUENCY (16)	Anywhere between 30 Hz - 14 kHz
WIDEBAND RANGE (1)	1 volt (120 db)
FUNCTION selector (14)	IF Video
DETECTOR selector (6)	+ PEAK

* See Figure 3.1, EMC-10 Instruction Manual

3.6.3 Connect the probe PCL-10 around the cable to be tested.

3.6.4 Output at the current probe is connected to the current probe amplifier (P1, Fig. 4.1) PCA-10 through coax-cable Model CAC-10 or equivilant.

3.6.5 Output (J1, Fig. 4.1) of the current probe amplifier is fed through the permanently attached coax-cable to the input connector (22, Fig. 4.3B) of the EMC-10.

3.6.6 Connect (P2, Fig. 4.1) probe connect to probe socket (20, Fig. 4.3B) on the EMC-10.

3.6.7 A single meter reading is made. If the reading on the front panel is below -20 db, the Mil-Std-826A requirement is met for broadband onducted measurements on the cable being tested from 30 Hz to 14 kHz per method 3005, Mil-Std-826A.

SECTION IV
SERVICE AND MAINTENANCE

4.1 GENERAL

4.1.1 This section includes material necessary for the proper calibration, maintenance, and repair of the PCA-10. If the following procedures are adhered to, the instrument will provide years of accurate, reliable service. However, failure to follow these procedures could violate the terms of the manufacturer's warranty, in addition to limiting the reliability of the instrument.

4.2 INSTRUMENT ACCESS

4.2.1 To gain access to the interior remove the 14 screws on the sides and top of the housing.

4.3 PERIODIC SERVICE CALIBRATION

4.3.1 Efficient operation depends upon a properly serviced, maintained, and calibrated EMC-10 according to Section IV in the EMC-10 Instruction Manual.

4.3.2 PCA-10, PCL-10, and EMC-10 calibration test.

4.3.3 This test may be conducted each time as part of the periodic maintenance procedure.

4.3.4 Calibrate the EMC-10 according to paragraph 3.12 of the EMC-10 Instruction Manual.

4.3.5 Set the front panel controls of the EMC-10 as follows:

POWER switch	OFF (in the down position)
IMPEDANCE selector	600 ohms
WIDEBAND RANGE	1v (120 db)
SELECTIVE RANGE	1v (120 db)
FILTER	50 kHz
BANDWIDTH	Wideband
FUNCTION selector	Cal-tracking
FREQUENCY	10 kHz

4.3.6 Connect a CAC-10 cable from cal-tracking output (12, Fig. 4.3A) directly to input (22, Fig. 4.3A) on the EMC-10.

4.3.7 Turn the power on (in the UP position) and adjust LEVEL control (13, Fig. 3.1)* for a full scale meter reading.

4.3.8 After a reference is established, remove the CAC-10 cable entirely.

4.3.9 Connect a one turn loop of cable terminated in 600 ohms (Fig. 4.2) to the cal-tracking output (12, Fig. 4.3B).

4.3.10 Clamp the current probe, PCL-10, around the cable loop and connect the CAC-10 cable from the PCL-10 to the connector (P1, Fig. 4.1) on the PCA-10.

4.3.11 The coax-cable with the BNC connector (J1, Fig. 4.1) on the PCA-10 should be connected to the input (22, Fig. 4.3B) of the EMC-10.

4.3.12 Connect and lock the power connector (P2, Fig. 4.1) to the probe connector (20, Fig. 4.3B) by pushing the locking bar all the way toward tne meter side of the EMC-10 after the connector is engaged.

4.3.13 The input IMPEDANCE selector (23, Fig. 3.1)* on the EMC-10 should be changed from 600 ohms to 10K ohms. The proceding setup is shown in Fig. 4.3B.

4.3.14 The PCA-10 and PCL-10 should have a one ohm transfer impedance, therefore, the meter should now read 1.6MV, (1v/600 ohms). 1.6MV can be converted directly to a current of 1.6MA, $I_1=E_o/Z_t$.

4.3.15 If the EMC-10 does not read 1.6MV after carefully following the above procedure, consult paragraph 4.4.

4.4 CALIBRATION FOR THE PCA-10, PCL-10 COMBINATION

NOTE

Instruments that are shipped together

*EMC-10 Instruction Manual

as a combination are subjected to tests and calibration as a combination of the factory, therefore, it is recommended that the following calibration be performed only if absolutely necessary.

4.4.1 Remove the cover to gain access to the subassembly.

4.4.2 Witch the test circuit as shown in Fig. 4.3B connected, adjust the gain of the PCA-10, a screw driver adjustment, located behind a cutout on the side of the internal housing until the proper reading of 1.6MV is obtained on the EMC-10 meter. The PCA-10 and PCL-10 now have the specified one ohm transfer impedance and are so calibrated.

4.5 TROUBLE SHOOTING

4.5.1 Figure 4.1 provides the operating voltages of the PCA-10, should a voltage check be necessary.

4.5.2 Faulty operation may be caused by improper operating voltages from the EMC-10 or damaged cables.

4.5.3 Damaged cables and/or connectors may be isolated by making continuity measurements.

4.5.4 If faulty operation is traced to the amplifier subassembly of the PCA-10, the unit should be returned to the factory to be repaired or replaced. No attempt should be made to service the sealed subassembly.

4.6 PACKAGING FOR SHIPMENT

4.6.1 Should it become necessary to return the instrument or a component to the factory for repair or replacement, package in accordance with the following procedure:

a) Repackage in original shipping carton if available.

b) If original container is not available, package in cardboard carton, cushioning all sides with a resilient material. Pack material firmly around the instrument to provent motion.

c) Seal cardboard container with cloth shipping tage.

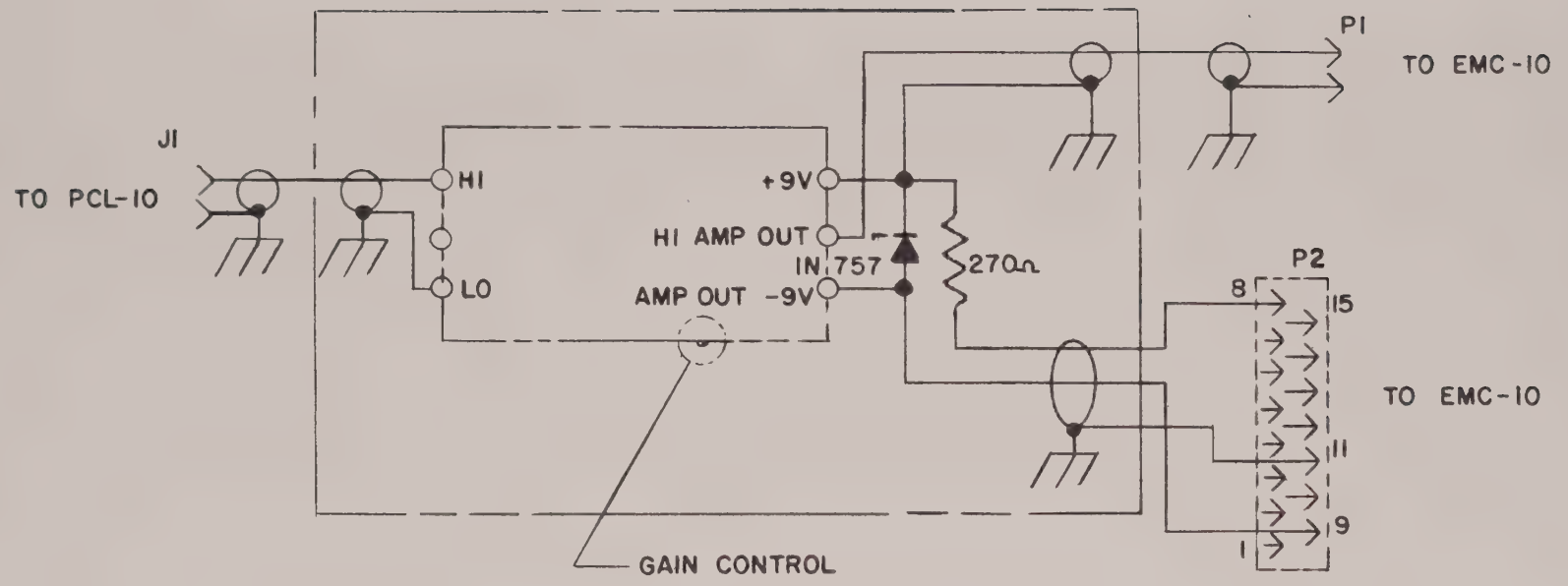
d) Enclose packing slip for every item shipped.

NOTE

Before packaging instrument, on company stationery, list the serial number of the instrument, the nature of the malfunction, and the name of an individual whom the manufacturer can contact for additional information. Please include return shipping address.

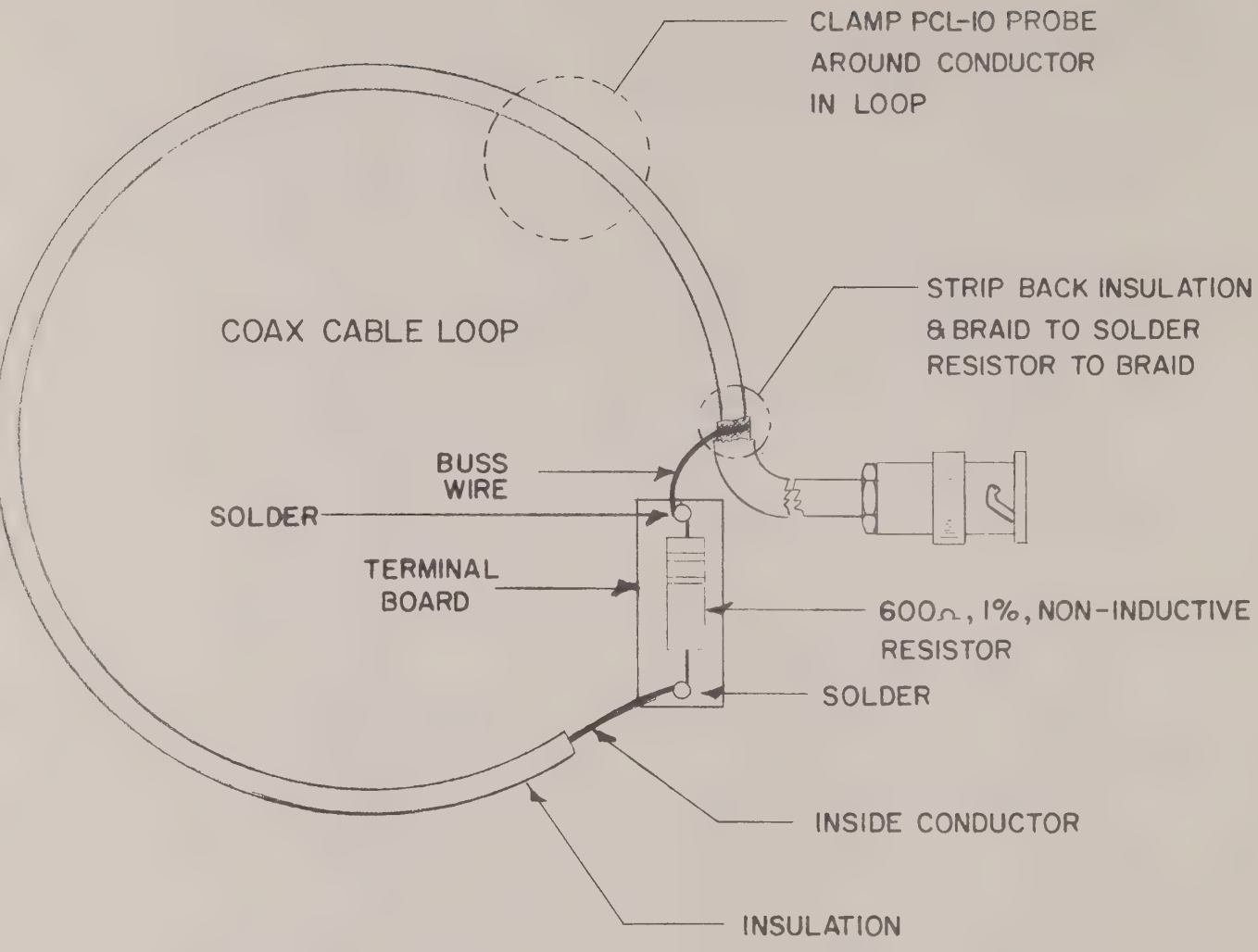
4.7 PARTS LIST

a) BNC cable assembly	B-2610
b) Multi-pin plug cable assembly	B-2611
c) Amplifier subassembly	GHP-305B
d) BNC connector	056-1
e) Diode (ZENER 9v)	1N757
f) Resistor (270 ohm, 1/4w, 10%)	RC07GF271K



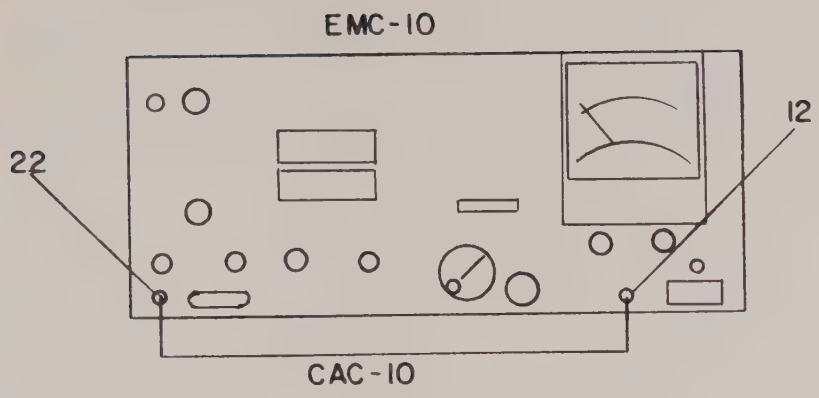
SCHEMATIC DIAGRAM

Figure 4.1



The test loop can be made from a coax-cable with one end secured to a BNC connector and the other end to a 600 ohm, 1%, non-inductive resistor mounted on a terminal board, by stripping back the outer insulation and braid conductor approximately 16" leaving just enough braid exposed to solder the buss wire to the braid. The buss wire and inside conductor are soldered to the terminals of the board.

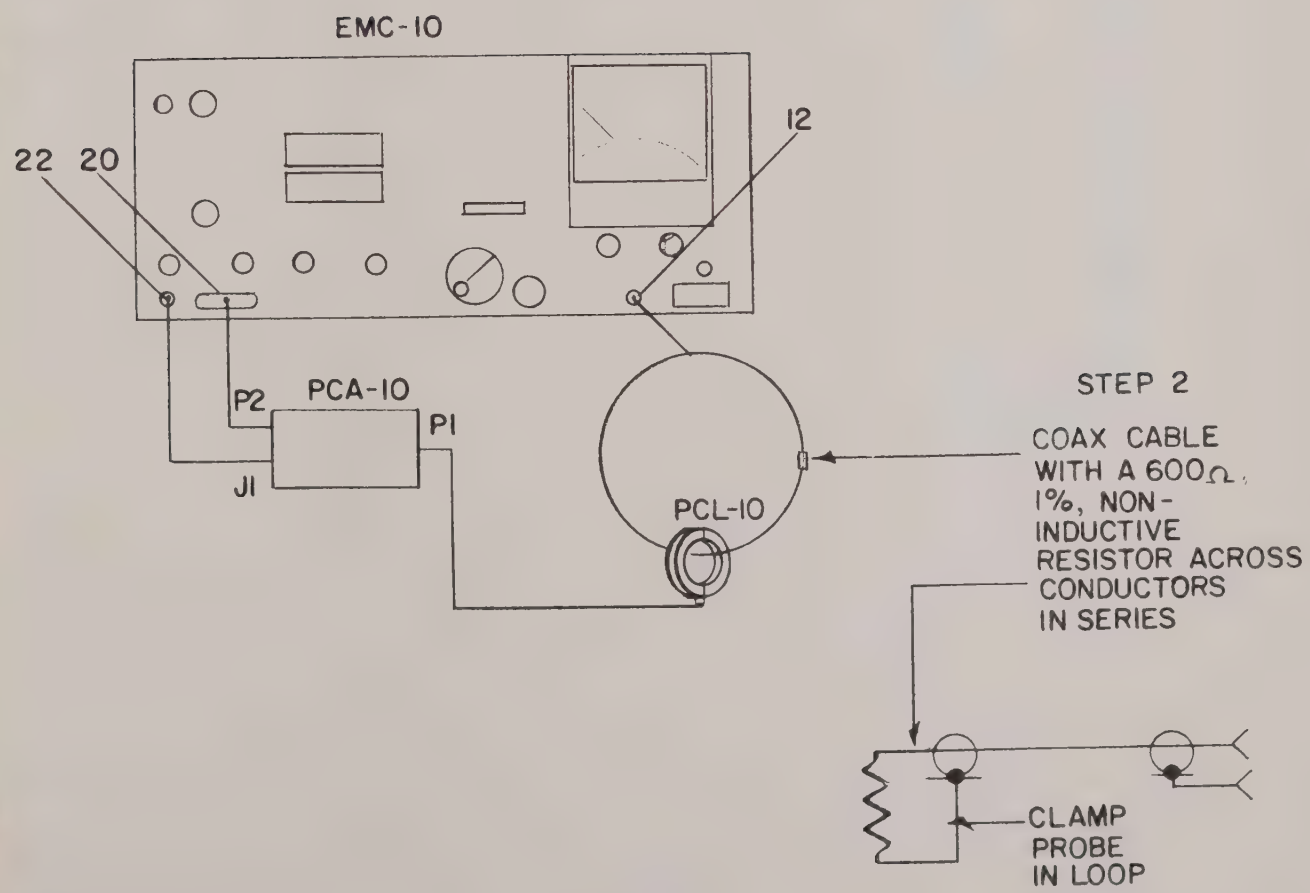
Figure 4.2



STEP 1

CONNECT CABLE FROM 22 TO 12, TO ESTABLISH A REFERENCE ON METER

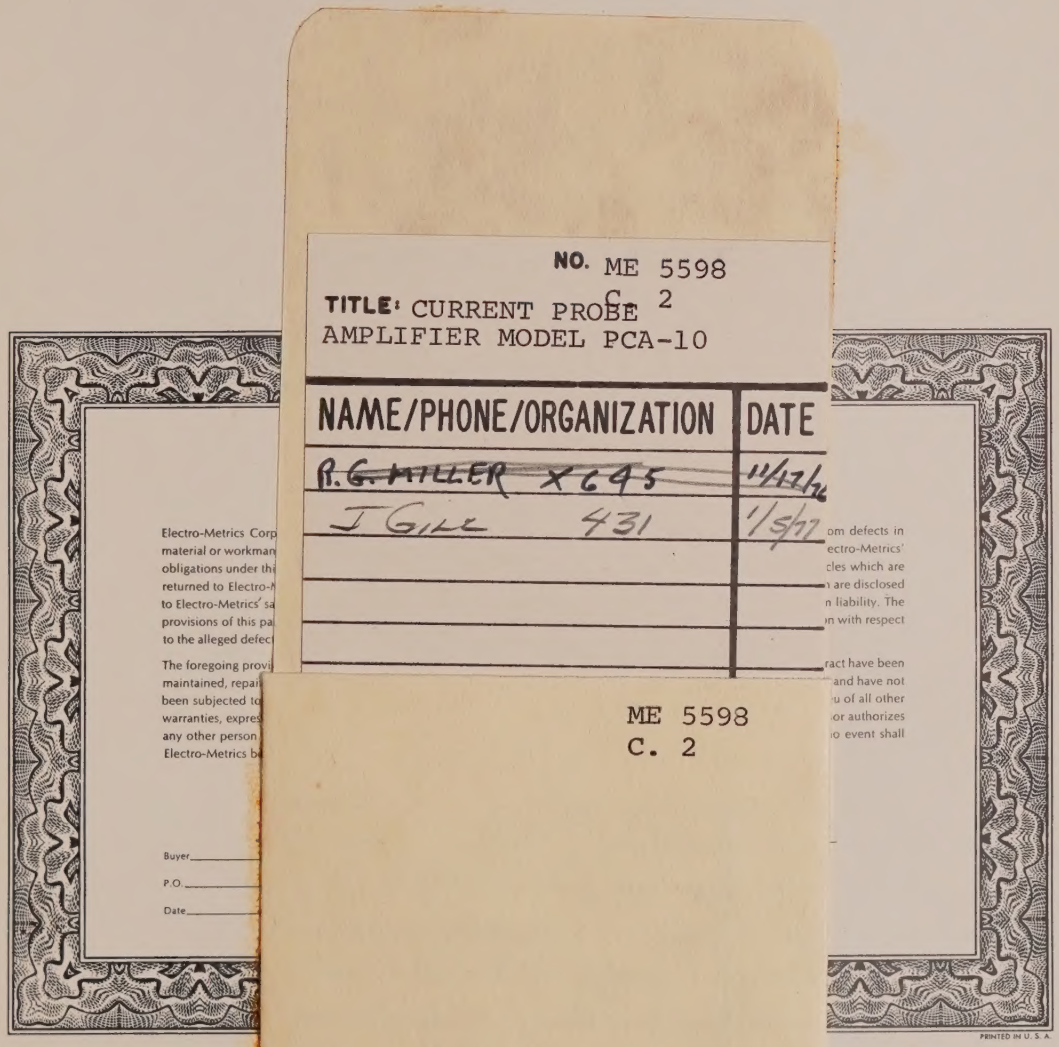
Figure 4.3A



STEP 2

COAX CABLE WITH A 600Ω, 1%, NON-INDUCTIVE RESISTOR ACROSS CONDUCTORS IN SERIES

Figure 4.3B



NO. ME 5598
C. 2

TITLE: CURRENT PROBE
AMPLIFIER MODEL PCA-10

NAME/PHONE/ORGANIZATION	DATE
~~R.G. MILLER X645~~	~~11/17/76~~
J GILL 431	1/5/77

ME 5598
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